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Item 5 of the provisional agenda
Regulations Nos. 85 (Measurement of the net power), 115 (LPG and CNG retrofit systems), 133 (Recyclability of motor vehicles) and 143 (Heavy Duty Dual-Fuel Engine Retrofit Systems (HDDF-ERS))

Proposal for a new Supplement to the original version of Regulation No. 85 (Measurement of the net power)

Submitted by the expert from the International Organization of Motor Vehicle Manufacturers*

The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA). Following the last session of the Working Party on Pollution and Energy (GRPE) (see report ECE/TRANS/WP.29/GRPE/75, para. 30), this document proposes a solution for the concern raised by the expert from the United Kingdom of Great Britain and Northern Ireland (UK) in GRPE-75-13 and corrects a long standing error in a formula shown by OICA in GRPE-75-12. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.17-18407(E)

1718407

Please recycle

I. Proposal

Paragraph 5.3.1.3., amend to read:

"5.3.1.3. Just before beginning the test, the motor shall be run on the bench for three minutes delivering a power equal to **or higher than** 80 per cent of the maximum ~~power~~ **30 minutes power** at the speed recommended by the manufacturer."

Annex 5, paragraph 5.4.2., amend to read:

"5.4.2. Diesel engines - Factor α_d

The power correction factor (α_d) for diesel engines at constant fuel rate is obtained by applying the formula:

Where $\alpha_d = (f_a)^{f_m}$

f_a is the atmospheric factor

f_m is the characteristic parameter for each type of engine and adjustment"

II. Justification

1. Both "80% maximum power" and "80% maximum 30 minutes power" are technically correct methods. The most suitable method depends on the motor cooling technology (air cooled or water/oil cooled motors).

2. UK raised a concern for air-cooled motors, where a 3 minute warm-up at 80 per cent maximum power can result in the declared net power figures being much lower than the actual power of the motor (due to activation of thermal protection of the motor), while in real world use, operating above 80 per cent maximum net power is only expected for a very short time, most driving is expected to be in the 30 minutes power range.

3. Considering the arguments above, and also in order to maintain consistency with previous test results whenever possible, we propose that manufacturers can make both choices (30 minutes power or maximum power) depending on their technology.

4. At some time in the evolution of the text, the parameter f_m changed from being a superscript to being normal text (i.e. the formula changed from reading "f_a to the power of f_m" to reading "f_a multiplied by f_m"). This is incorrect and should be corrected.

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Item 3(a) of the provisional agenda
Light vehicles – Regulations Nos. 68 (Measurement of the maximum speed, including electric vehicles), 83 (Emissions of M_1 and N_1 vehicles), 101 (CO_2 emissions/fuel consumption) and 103 (Replacement pollution control devices)

Proposal for a new Supplement to the 06 and 07 series of amendments to Regulation No. 83 (Emissions of M_1 and N_1 vehicles)

Submitted by the expert from the International Organization of Motor Vehicle Manufacturers*

The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) to clarify the extension rule related to the mass defined in paragraph 7. of Regulation No. 83 as regards to its application to vehicles of category N. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.17-18408(E)

1718408

Please recycle

I. Proposal

Paragraph 7.1.1.2., amend to read:

"7.1.1.2. For category N vehicles, the approval shall be extended ~~only~~ to vehicles with a lower reference mass, **only** if the emissions of the vehicle already approved are within the limits prescribed for the vehicle for which extension of the approval is requested."

II. Justification

1. Paragraph 7.1.1.1. defines the general extension rule for vehicles having different reference masses:

7.1.1.1. The type approval shall be extended only to vehicles with a reference mass requiring the use of the next two higher equivalent inertia or any lower equivalent inertia.

2. This requirement applies equally to vehicles of category M or N, but in the case of vehicles of category N, for which the emission limits increase with the reference mass, it is necessary to ensure that an extension is not granted to a lighter vehicle using abusively the less severe limits applicable to heavier vehicles.

3. However, the current wording in paragraph 7.1.1.2. may suggest that, in addition to the mentioned point here above, no extension should be granted to vehicles with a reference mass greater than the mass of the type-approved vehicle. This has no reason to be.

4. The proposal removes this ambiguity.

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Light vehicles – Regulations Nos. 68 (Measurement of the maximum speed, including electric vehicles), 83 (Emissions of M_1 and N_1 vehicles), 101 (CO_2 emissions/fuel consumption) and 103 (Replacement pollution control devices)

Proposal for a new Supplement to the 06 and 07 series of amendments to Regulation No. 83 (Emissions of M_1 and N_1 vehicles)

Submitted by the expert from the International Organization of Motor Vehicle Manufacturers*

The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) to adapt the provisions of the 06 and 07 series of amendments to Regulation No. 83 on Selective Catalytic Reduction (SCR) warning and inducement systems to current vehicles, emissions requirements and reagent infrastructure. ECE/TRANS/WP.29/GRPE/2017/5 was prepared for the seventy-fourth session of the Working Party on Pollution and Energy (GRPE) but it was withdrawn to allow discussion within the European Union. This document reflects the conclusion of those discussions but due to the extent of the modifications is submitted as a new official document. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.17-18456(E)

1718456

Please recycle

I. Proposal

Appendix 6,

Insert new paragraphs 1.1. and 1.2., to read:

"**1.1.** **The capacity of the reagent tank shall be such that a full tank does not need to be replenished over an average driving range of 5 full fuel tanks providing the tank can be easily replenished (e.g. without the use of tools and without removing vehicle interior trim. The opening of an interior flap, in order to gain access for the purpose of reagent replenishment, shall not be understood as the removal of interior trim). If the tank is not considered to be easy to replenish as described above, the minimum tank capacity shall be at least equivalent to an average driving distance of 15 full fuel tanks. However, in the case that in paragraph 3.5. of this annex, the manufacturer chooses to start the warning system at a distance which may not be less than 2,400 km before the reagent tank becomes empty, the above restrictions on a minimum tank capacity shall not apply.**

1.2. **In the context of this annex, the term "average driving distance" shall be taken to be derived from the fuel or reagent consumption during a type 1 test for the driving distance of a fuel tank and the driving distance of a reagent tank respectively."**

Paragraph 2.1., amend to read:

"2.1. The vehicle shall include a specific indicator on the dashboard that informs the driver ~~of low levels of reagent in the reagent storage tank and of when the reagent tank becomes empty~~ **when reagent levels are below the threshold values specified in paragraph 3.5. of this annex."**

Paragraph 3.1., amend to read:

"3.1. The vehicle shall include a warning system consisting of visual alarms that informs the driver when **an abnormality is detected in the reagent dosing e.g. when emissions are too high,** the reagent level is low, ~~that the tank soon needs to be refilled,~~ **reagent dosing is interrupted** or the reagent is not of a quality specified by the manufacturer. The warning system may also include an audible component to alert the driver."

Paragraph 3.4., amend the last sentence to read:

"3.4. . . . The continuous warning system may be temporarily interrupted by other warning signals providing **that they are** important safety related messages."

Paragraph 3.5., amend to read:

"3.5. The warning system shall activate at a distance equivalent to a driving range of at least 2,400 km in advance of the reagent tank becoming empty, **or at the choice of the manufacturer at the latest when the level of reagent in the tank reaches one of the following levels:**

(a) a level expected to be sufficient for driving 150% of an average driving range with a complete tank of fuel; or

(b) 10% of the capacity of the reagent tank,

whichever occurs earlier."

Paragraph 5.5., amend to read:

"5.5. In the case of interruption in reagent dosing activity the driver warning system as referred to in paragraph 3. shall be activated, which shall display a message indicating an appropriate warning. ~~This activation shall not be required where the interruption is demanded by the Engine Control Unit (ECU)~~ **Where the reagent dosing interruption is initiated by the engine system** because the vehicle operating conditions are such that the vehicle's emission performance does not require reagent dosing, **the activation of the driver warning system as referred to in paragraph 3 may be omitted,** provided that the manufacturer has clearly informed the Type Approval Authority when such operating conditions apply. If the reagent dosing is not rectified within 50 km of the activation of the warning system then the driver inducement requirements of paragraph 8. below shall apply."

Paragraph 6.2., amend the first sub-paragraph to read:

"6.2. The manufacturer shall demonstrate that use of the sensors referred to in paragraph 6.1. above and any other sensors on the vehicle, results in the activation of the driver warning system as referred to in paragraph 3. above, the display of a message indicating an appropriate warning (e.g. "emissions too high - check urea", "emissions too high - check AdBlue", "emissions too high - check reagent"), and the **activation of the** driver inducement system as referred to in paragraph 8.3. below, when the situations referred to in paragraphs 4.2., 5.4. or 5.5. above occur."

In the 06 series of amendments, paragraph 6.2., insert a second sub-paragraph to read:

"For the purposes of this paragraph these situations are presumed to occur if the applicable NOx limit of the table set out in paragraph 5.3.1.4. of this Regulation multiplied by a factor of 1.5 is exceeded. The NOx emissions during the test to demonstrate compliance with these requirements shall be no more than 20 per cent higher than the above threshold."

Paragraph 8.2., amend to read:

"8.2. The inducement system shall activate at the latest when the level of reagent in the tank reaches:

(a) **In the case that the warning system was activated at least 2,400 km before the reagent tank was expected to become empty,** a level ~~equivalent to~~ **expected to be sufficient for driving** the average driving range of the vehicle with a complete tank of fuel.

(b) **In the case that the warning system was activated at the level described in paragraph 3.5.(a), a level expected to be sufficient for driving 75% of the average driving range of the vehicle with a complete tank of fuel; or**

(c) **In the case that the warning system was activated at the level described in paragraph 3.5.(b), 5 per cent of the capacity of the reagent tank.**

(d) **In the case that the warning system was activated ahead of the levels described in both paragraph 3.5.(a) and 3.5.(b), whichever level described in (a) or (b) of this paragraph occurs earlier.**

Where the alternative described in paragraph 6.1. is utilised, the system shall activate when the failures described in paragraphs 4 or 5 or the NOx levels described in paragraph 6.2. have occurred.

~~The system shall also activate when the failures in paragraphs 4., 5., or 6. above have occurred, depending on the NOx monitoring approach.~~ The detection of an empty reagent tank and the ~~failures~~ **irregularities** mentioned in paragraphs 4., 5., or 6. above shall result in the failure information storage requirements of paragraph 7. above **taking** ~~coming into~~ effect."

Paragraph 8.3.1., amend to read:

"8.3.1. A "no engine restart after countdown" approach allows a countdown of restarts or distance remaining once the inducement system activates. Engine starts initiated by the vehicle control system, such as start-stop systems, are not included in this countdown. Engine restarts shall be prevented immediately after:

(a) In the case that the inducement system was activated at least 2400 km before the reagent tank was expected to become empty, the vehicle has travelled a distance expected to be sufficient for driving the average driving range of the vehicle with a complete tank of fuel since the activation of the inducement system, or

(b) In the case that the inducement system was activated at the level described in paragraph 8.2.(b), the vehicle has travelled a distance expected to be sufficient for driving 75 % of the average driving range of the vehicle with a complete tank of fuel since the activation of the inducement system, or

(c) In the case that the inducement system was activated at the level described in paragraph 8.2.(c), the vehicle has travelled a distance expected to be sufficient for driving the average driving range of the vehicle with 5 per cent of the capacity of the reagent tank, since the activation of the inducement system, or

(d) In the case that the inducement system was activated ahead of the levels described in both paragraph 8.2.(b) and 8.2.(c) but less than 2400 km before the reagent tank was expected to become empty, whichever distance described in (b) or (c) of this paragraph is the shorter, or

the reagent tank becomes empty ~~or a distance equivalent to a complete tank of fuel has been exceeded since the activation of the inducement system, whichever occurs~~ **should this occur** earlier."

Paragraph 8.3.4., amend to read:

"8.3.4. A "performance restriction" approach restricts the speed of the vehicle after the inducement system activates. The level of speed limitation shall be noticeable to the driver and significantly reduce the maximum speed of the vehicle. Such limitation shall enter into operation gradually or after an engine restart. Shortly before engine restarts are prevented, the speed of the vehicle shall not exceed 50 km/h. Engine restarts shall be prevented immediately after:

(a) In the case that the inducement system was activated at least 2,400 km before the reagent tank was expected to become empty, the vehicle has travelled a distance expected to be sufficient for

driving the average driving range of the vehicle with a complete tank of fuel since the activation of the inducement system, or

(b) In the case that the inducement system was activated at the level described in paragraph 8.2.(b), the vehicle has travelled a distance expected to be sufficient for driving 75 % of the average driving range of the vehicle with a complete tank of fuel since the activation of the inducement system, or

(c) In the case that the inducement system was activated at the level described in paragraph 8.2.(c), the vehicle has travelled a distance expected to be sufficient for driving the average driving range of the vehicle with 5 per cent of the capacity of the reagent tank, since the activation of the inducement system or

(d) In the case that the inducement system was activated ahead of the levels described in both paragraph 8.2.(b) and 8.2.(c) but less than 2400 km before the reagent tank was expected to become empty, whichever distance described in (b) or (c) of this paragraph is the shorter, or

the reagent tank becomes empty ~~or a distance equivalent to a complete tank of fuel has been exceeded since the activation of inducement system, whichever occurs~~ **should this occur** earlier."

Paragraph 8.4., amend to read:

"8.4. Once the inducement system has **prevented engine restarts** ~~fully activated and disabled the vehicle~~, the inducement system shall only be deactivated if ~~the quantity of reagent added to the vehicle is equivalent to 2,400 km average driving range, or~~ the **irregularities** ~~failures~~ specified in paragraphs 4., 5., or 6. of this appendix have been rectified **or if the quantity of reagent added to the vehicle meets at least one of the following criteria:**

(a) expected to be sufficient for driving 150% of an average driving range with a complete tank of fuel; or

(b) at least 10 per cent of the capacity of the reagent tank;

After a repair has been carried out to correct a fault where the OBD system has been triggered under paragraph 7.2. above, the inducement system may be reinitialised via the OBD serial port (e.g. by a generic scan tool) to enable the vehicle to be restarted for self-diagnosis purposes. The vehicle shall operate for a maximum of 50 km to enable the success of the repair to be validated. The inducement system shall be fully reactivated if the fault persists after this validation."

Delete paragraph 8.6. and renumber paragraphs 8.7. and 8.8. as 8.6. and 8.7.

Paragraph 9.3., amend to read:

"9.3. The instructions shall specify if consumable reagents have to be **replenished** ~~refilled~~ by the vehicle operator between normal maintenance intervals. They shall indicate how the **vehicle operator** ~~driver~~ should **replenish** ~~refill~~ the reagent tank. The information shall also indicate a likely rate of reagent consumption for that type of vehicle and how often it should be replenished."

Paragraph 9.4., amend to read:

"9.4. The instructions shall specify that use of, and **replenishing** ~~refilling~~ of, a required reagent of the correct specifications is mandatory for the vehicle to comply with the certificate of conformity issued for that vehicle type."

Paragraph 10., amend to read:

"10. Operating conditions of the after-treatment system Manufacturers shall ensure that the emission control system retains its emission control function during all ambient conditions, especially at low ambient temperatures. This includes taking measures to prevent the complete freezing of the reagent during parking times of up to 7 days at 258 K (-15 °C) with the reagent tank 50 per cent full. If the reagent ~~has~~ **is** frozen, the manufacturer shall ensure that reagent shall be ~~available~~ **liquefied and ready** for ~~use~~ **correct operation of the emission control system** within 20 minutes **of after** the vehicle ~~starting~~ **was started** at 258 K (-15 °C) measured inside the reagent tank, ~~so as to ensure correct operation of the emission control system~~."

II. Justification

1. The first introduction of reagent-based NOx-aftertreatment required the acceptance of the customer for an additional consumable operating fluid. For this reason, where possible the reagent tank size was designed to require reagent refuelling only at regular service intervals. Therefore, a long-range driver warning to refill AdBlue® was needed to cater for normal servicing intervals, arrange AdBlue®/workshop availability and to plan accordingly. This need is reflected by the current legal requirements which can be summarized as follows.

2. For passenger cars the warning indicator to refill AdBlue® has to be activated at 2,400 km of remaining reagent range. The inducement system, which encourages the customer to refill the reagent tank, has to be activated at least at a fuel-range of one tank. This is equivalent to approximately 800 km.

3. The need for further vehicle weight reduction for CO_2 optimisation and vehicle packaging problems will imply smaller AdBlue® tanks. The wide roll-out of easy AdBlue® refilling (with needed political support to ongoing industry activities) must start happening, at least in regions applying Euro 6 emissions limits. Customers are generally familiar with AdBlue® (but increased communications will be needed as SCR is widely applied) and refilling will be eased by the roll-out of AdBlue® pump nozzles next to diesel pumps – therefore the need for more frequent AdBlue® refilling by the customer can be addressed. Collaboration is needed.

4. Service stations where AdBlue® can be purchased can be found online at least in Europe, for example www.findadblue.com and industry is working on several pilot projects at filling stations for car AdBlue® refilling.

5. With the necessary focus on smaller AdBlue® tanks, the current warning scenario distance of 2,400 km would equal a high percentage of the total reagent tank volume across the diesel car fleet and would result in customers needing to refill the AdBlue® tank at nearly every other refuelling stop.

6. In the United States of America, where larger distances are driven on average compared to Europe, 1,000 miles was fixed by the Environmental Protection Agency (EPA) as the warning scenario limit for AdBlue® in 2007, even without the security of a more widespread AdBlue® refilling infrastructure at that time.

7. For heavy-duty vehicles, the warning has to be activated at least at a reagent level of 10 per cent of total reagent tank volume. The inducement system has to be activated at least at 2.5 per cent of reagent level.

8. Considering the improved AdBlue® refilling infrastructure leading to easier refilling of AdBlue® by customers, increased customer knowledge and acceptance of AdBlue®, the activation of the warning/inducement should be adopted according to these values.

9. The provisions should permit the manufacturer in agreement with the Type Approval Authority to determine the starting point for warning and inducement system activation within reasonable limits for the vehicle type to avoid unsatisfied customers facing frequent and untimely warning messages. The warning and inducement requirements for heavy-duty vehicles provides a reasonable starting point, which should be taken over into the Euro 6 legislation as an option for the manufacturer.

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Light vehicles – Global Technical Regulations Nos. 15 (Worldwide harmonized Light vehicles Test Procedures (WLTP)) and 19 (Evaporative emission test procedure for the Worldwide harmonized Light vehicle Test Procedure (WLTP EVAP))

Proposal for the technical report on the development of Amendment 4 to global technical regulation No. 15 (Worldwide harmonized Light vehicles Test Procedures (WLTP))

Submitted by the Informal Working Group on Worldwide harmonized Light vehicles Test Procedure (WLTP)*

The text reproduced below was prepared by the Informal Working Group (IWG) on Worldwide harmonized Light vehicles Test Procedure (WLTP). This is the technical report submitted together with the proposal for Amendment 4 to global technical regulation No. 15 on WLTP (ECE/TRANS/WP.29/GRPE/2018/2).

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.17-18458(E)

1718458

Please recycle

Technical report on the development of Amendment 4 to global technical regulation No. 15 on Worldwide harmonized Light vehicles Test Procedures (WLTP)

I. Mandate

1. Amendment 4 to UN global technical regulation (GTR) No. 15 was developed by the Informal Working Group (IWG) on Worldwide harmonized Light vehicles Test Procedures (WLTP) in the framework of Phase 2 of the development of GTR No. 15. The Executive Committee (AC.3) of the 1998 Agreement adopted the authorisation to develop Phase 2 of GTR No. 15 at its June 2016 session (ECE/TRANS/WP.29/AC.3/44).

II. Objectives

2. To introduce definitions of response time, delay time and rise time harmonized with those in GTR Nos. 4 (heavy-duty engine emissions) and 11 (non-road compression ignition engine emissions).

3. To introduce improvements to the gear shifting procedures. n_{rated} is now defined as the rated engine speed declared by the manufacturer as the engine speed at which the engine develops its maximum power. Experts approved to limit $n_{min_drive_up/down}$ to twice $n_{min_drive_set}$ whereas the current regulation allows the manufacturer to use higher n_{min_drive} values without any limitation.

Furthermore, since the duration of the cold start phase is engine and vehicle design dependent, it was agreed that a manufacturer should have the possibility to specify the time span and the n_{min_drive} value individually within the low phase of the cycle.

However, the time span should be specified such that it ends in a stop phase so that there is no change of n_{min_drive} within a short trip.

4. To introduce consistency in the use of the terms accuracy, precision, resolution, tolerance, repeatability and deviation.

5. To introduce bi-fuel and bi-fuel gas vehicles keeping in line with Regulation No. 83. Definitions and a new Appendix (Annex 6, Appendix 3, Calculation of gas energy ratio for gaseous fuels (Liquefied Petroleum Gas and Natural Gas/biomethane)) were incorporated into the GTR.

6. To introduce the appropriate positioning of payload mass (25 kg plus the mass of vehicle load) has until now not been clearly defined. Additional masses for setting the test mass shall be applied such that the weight distribution of that vehicle is approximately the same as that of the vehicle with its mass in running order. In case of category 2 vehicles or passenger vehicles derived from category 2 vehicles, the additional masses should be located in a representative manner and shall be justified to the responsible authority upon their request. The weight distribution of the vehicle shall be recorded and shall be used for any subsequent road load determination testing.

7. To correct terminology such as "classes of rolling resistance coefficients". Tables relating to energy efficiency classes according to rolling resistance coefficients for tyres have been modified accordingly.

8. To correct minor spelling and/or punctuation mistakes, and restructuring some paragraphs. To keep writing and formatting consistently within the GTR.

9. To correct some equations and to make them all consistent with Word's use of mathematical symbols.

10. To exclude all Rechargeable Electric Energy Storage Systems (REESSs) that do not contribute to vehicle propulsion from monitoring.

11. To better define the purity of certain gases such as nitrogen and synthetic air.

12. To define more specifically the difference in mass of CO_2 during charge sustaining between the test with the highest and lowest positive and negative electric energy charge.

III. Meetings held by Task Forces

13. The proposed changes in Amendment 4 to GTR No. 15 listed in section II above were discussed at length and agreed upon by all participants during the following Task Force (TF) face-to-face or audio/web meetings:

(a) The nineteenth IWG meeting in June 2017 in Geneva;

(b) Dynamometer TF (once), New Issues TF (once), EV TF (3 times). Two audio/webs on Movable Aerodynamic Body Parts (MABPs) were held but there is not yet a finalized text.

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Item 4(a) of the provisional agenda
Heavy duty vehicles - Regulations Nos. 49 (Emissions of compression ignition and positive ignition (LPG and CNG) engines) and 132 (Retrofit Emissions Control devices (REC))

Proposal for a new Supplement to the 05 series of amendments to Regulation No. 49 (Emissions of compression ignition and positive ignition (LPG and CNG) engines)

Submitted by the expert from the International Organization of Motor Vehicle Manufacturers*

The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) to improve the so-called "random check requirement" and define the rounding of test results calculated according to Annex 4A in the 05 series of amendments to Regulation No. 49. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

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Please recycle

I. Proposal

Paragraph 5.2.3.1., amend to read:

"5.2.3.1. The specific mass of the oxides of nitrogen measured at the random checkpoints within the control area of the ESC test shall not exceed by more than 10 per cent the values interpolated from the adjacent test modes (reference Annex 4A, Appendix 1, paragraphs 5.6.2. and 5.6.3.) **or the limit values in Table 1 in paragraph 5.2.1., whichever is greater**."

Annex 6, insert a new paragraph 5., to read:

"**5. Rounding**

The final test result shall be rounded to the number of places to match the number of decimal places of the applicable emission standard. No rounding of intermediate values leading to the final break-specific emission result is permitted."

II. Justification

1. Random check requirement (paragraph 5.2.3.1.)

Current provisions prevent from introducing engines with much lower emission levels than specified for EURO IV/V (e.g. Euro VI < 0.4 g/kWh). The 10 per cent tolerance band of these very low emission values are below the accuracy of this method (measurement, interpolation, etc…). The provision was defined for EURO IV/V' engines and lead to the fact that low emission engines (EURO VI) cannot fulfil the provisions. The proposal enables to certify Euro VI derived engine types for specific markets according to the 05 series of amendments to Regulation No. 49.

2. Rounding of test results (Annex 6)

The 05 series of amendments to Regulation No. 49 do not specify rounding method for calculating the test results according to the requirements in Annex 4A. A Calculation example is pointed out in Annex 6. This leads to different interpretation. The proposal is in line with the applied praxis when this Regulation was applied in the European Union in the past (EURO III to V), with general mathematic rounding principles and in line with the rounding method applied by the Environmental Protection Agency in the United States of America (40 Code of Federal Register Part 1065). Adding proposed paragraph 5. to Annex 6 will clarify it.

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Item 4(a) of the provisional agenda
Heavy duty vehicles - Regulations Nos. 49 (Emissions of compression ignition and positive ignition (LPG and CNG) engines) and 132 (Retrofit Emissions Control devices (REC))

Proposals for a new Supplement to the 06 series of amendments to Regulation No. 49 (Emissions of compression ignition and positive ignition (LPG and CNG) engines)

Submitted by the expert from the International Organization of Motor Vehicle Manufacturers*

The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) to improve the Engine Control Unit (ECU) torque signal validation requirement in the 06 series of amendments to Regulation No. 49. The present provisions force manufacturer to deliberately decrease accuracy of torque signal in case of additionally declared market fuels. The proposal takes into account the draft Supplement 5 to the 06 series of amendments to Regulation No. 49 adopted at the last session of the Working Part on Pollution and Energy (GRPE) (see report ECE/TRANS/WP.29/GRPE/75, para. 21), subject to the final adoption of ECE/TRANS/WP.29/2017/130 by the World Forum for Harmonization of Vehicle Regulations (WP.29) and the Administrative Committee (AC.1) of the 1958 Agreement at their November 2017 sessions. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

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I. Proposal

Paragraph 4.6.2., amend to read:

"4.6.2. If the manufacturer permits the engine family to run on market fuels that do not comply neither with the reference fuels included in Annex 5 nor CEN standard EN 228 (in the case of unleaded petrol) or CEN standard EN 590 (in the case of diesel), such as running on FAME B100 (CEN standard EN14214), FAME diesel blends B20/B30 (CEN standard EN 16709), paraffinic fuel (CEN standard EN 15940) or others the manufacturer shall, in addition to the requirements in paragraph 4.6.1. comply with the following requirements:

(a) Declare the fuels the engine family is capable to run on in paragraph 3.2.2.2.1. of the Information Document as set out in Part 1 of Annex 1, either by reference to an official standard or to a production specification of a brand specific market fuel not meeting any official standard such as those mentioned in paragraph 4.6.2. The manufacturer shall also declare that the functionality of the OBD system is not affected by the use of the declared fuel;

(b) **Determine the power correction factor for each fuel declared according to paragraph 9.4.2.8. if applicable according to the provisions specified in paragraph 9.4.2.7. Declare the factor for each fuel in 3.2.2.2.2. of the information document as set out in Part 1 of Annex 1 if applicable;**

(c) Demonstrate that the parent engine meets the requirements specified in Annex 4 and in Appendix 1 of Annex 10 to this Regulation on the fuels declared; the approval authority may request that the demonstration requirements be further extended to those laid down in Annex 7 and Annex 9A;

(d) Be liable to meet the requirements of in-service conformity specified in Annex 8 on the fuels declared, including any blend between the declared fuels and the relevant market fuels and standards.

At the request of the manufacturer, the requirements set out in this paragraph shall be applied to fuels used for military purposes.

For the purposes of subparagraph 4.6.2.(a) where the emission tests are performed for demonstrating compliance with the requirements of this Regulation, a fuel analysis report of the test fuel shall be attached to the test report and shall comprise at least the parameters specified in the official specification of the fuel manufacturer."

Paragraphs 9.4.2.5. to 9.4.3.3.1., amend to read:

"9.4.2.5. The average load at each operating condition in Nm calculated from the information requested in point 9.4.2.1. shall not differ from the average measured load at that operating condition by more than:

(a) 7 per cent when determining the engine power according to Regulation No. 85;

(b) 10 per cent when performing the World Harmonised Steady state Cycle (hereinafter "WHSC") **except for mode 1 and 13 (idle modes)** according to Annex 4, paragraph 7.7.

Regulation No. 85 allows the actual maximum load of the engine to differ from the reference maximum load by 5 per cent in order to address the manufacturing process variability. This tolerance is taken into account in the above values.

9.4.2.6. External access to the information required in point 9.4.2.1. shall not influence the vehicle emissions or performance.

9.4.2.7. If the manufacturer permits to operate an engine family to run on market fuels according to paragraph 4.2.6. the calculated torque built by the ECU may comply also for those fuels with the requirements specified in paragraph 9.4.2.5. If in case of a CI engine the difference between the measured torque value obtained with a declared market fuel and the torque calculated from the information requested in point 9.4.2.1. exceeds one of the values specified in point 9.4.2.5. the following paragraph 9.4.2.8 applies.

9.4.2.8. A power correction factor for each additional market fuel permitted by the manufacturer according to paragraph 4.2.6. shall be determined for the engine family. The correction factor shall be calculated from the relation between average measured peak torque with each market fuel declared and average measured peak torque with reference fuel according to Annex 5.

$$CP\ fuel_{declared} = \frac{M\ fuel_{ref}}{M\ fuel_{declared}}$$

Where:

***M* fuel$_{declared}$ is the peak torque with the market fuel declared, Nm**

***M* fuel$_{ref}$ is the peak torque with the dedicated reference fuel, Nm**

9.4.3. Verification of the availability and conformity of the ECU information required for in-service testing

9.4.3.1. The availability of the data stream information required in point 9.4.2.1. according to the requirements set out in point 9.4.2.2. shall be demonstrated by using an external OBD scan-tool as described in Annex X.

9.4.3.2. In the case where this information cannot be retrieved in a proper manner, using a scan-tool that is working properly, the engine is considered as non-compliant.

9.4.3.3. The conformity of the ECU torque signal to the general requirements ~~of points 9.4.2.2. and 9.4.2.3.~~ **specified in paragraph 9.4.2.** shall be demonstrated when determining the engine power according to Annex XIV and when performing the WHSC test according to Annex III.

9.4.3.3.1. The conformity of the ECU torque signal to the requirements of paragraphs 9.4.2.~~3. and 9.4.2.3.~~ shall be demonstrated for each engine family member when determining the engine power according to Regulation No. 85. For this purpose additional measurements shall be performed at several part load and engine speed operating points (for example at the modes of the WHSC and some additional random points). **If applicable the power**

correction factor for the engine family according to 9.4.2.8. shall be determined with the parent engine of the engine family."

Annex 1,

Part 1. amend to read:

"

3.2.2.	Fuel						
3.2.2.2.	Heavy duty vehicles Diesel/Petrol/LPG/NG-H/NG-L/NG-HL/Ethanol (ED95)/ Ethanol (E85)[1]						
3.2.2.2.1.	Fuels compatible with use by the engine declared by the manufacturer in accordance with paragraph 4.6.2. of this Regulation (as applicable)						
3.2.2.2.2.	**Power correction factor according to paragraph 9.4.2.8. for each fuel declared (if applicable)**						

"

Annex 8,

Paragraphs 4.4.2. and 4.4.2.1., amend to read:

"4.4.2. Fuel

The test fuel shall be market fuel covered by the relevant standards or reference fuel as specified in Annex 5 to this Regulation. ~~**Fuel samples shall be taken.**~~

4.4.2.1. If the manufacturer in accordance with paragraph 4. to this Regulation has declared the capability to meet the requirements of this Regulation on market fuels declared in paragraph 3.2.2.2.1. of Part 1 of Annex 1 to this Regulation, tests shall be conducted on at least one of the declared market fuels ~~**or blend between the declared market fuels and the market fuels covered by the relevant standards.**~~"

Insert a new paragraph 4.4.2.2., to read:

"4.4.2.2. Fuel samples shall be taken."

Annex 8, Appendix 1,

Insert a new paragraph A.1.4.2.1.1., to read:

"A.1.4.2.1.1. Calculation of the specific emissions for a declared market fuel

If a test according to this Annex was performed with a market fuel declared in paragraph 3.2.2.2.1. of Part 1 of Annex 1 to this Regulation and a power correction factor in accordance with paragraph 3.2.2.2.2. of Part 1 of Annex 1 to this Regulation was documented for the market fuel used for the test, the specific emissions e_{gas} (mg/kWh) shall be calculated for each window and each pollutant in the following way:

$$e_{gas,korr} = e_{gas} \times CP\ fuel_{declared}$$

Where:

e_{gas}	**is the specific emission (mg/kWh) according to A.1.4.2.1.**
$CP\ fuel_{declared}$	**is the applicable power correction factor for the market fuel declared according to paragraph 3.2.2.2.2. of Part 1 of Annex 1 to this Regulation."**

Annex 8, Appendix 4,

Insert a new paragraph A.4.2.1.1., to read:

"**A.4.2.1.1. If a market fuel declared in paragraph 3.2.2.2.1. of Part 1 of Annex 1 to this Regulation is used and a power correction factor in accordance with paragraph 3.2.2.2.2. of Part 1 of Annex 1 to this Regulation was documented for the dedicated market fuel used for the test, the ECU torque signal has to be corrected with this documented correction factor when it will be verfied with the reference maximum torque curve performed with this specific market fuel."**

II. Justification

1. The manufacturer can permit the use of an alternative fuel in addition to the standard fuel for which the engine is specified and certified with a defined reference fuel specified in the Regulation. If the manufacturer will do so according to the Regulation the engine must comply as specified in the information document also with the alternative fuel (e.g. Biodiesel or paraffinic fuel, etc…) with the requirements set in this Regulation. This has to be demonstrated during type approval and for in-service conformity. For example the engine is a compression ignition engine and the specified in-use fuel is diesel fuel according to EN 590 it has to comply with reference fuel and additionally with the alternative market fuel specified.

2. The problem in the present stage of the Regulation is the demonstration of the Engine Control Unit (ECU) torque data accuracy for this kind of "flex-fuel" approval. This information will be provided by the On-Board Diagnostic (OBD) interface for in-service conformity testing with Portable Emissions Measurement Systems (PEMS). Usually the heat values of the standard and alternative fuel are different and the information which fuel is used cannot be sensed and submitted automatically to the ECU. The ECU torque information can be calibrated only to one fuel standard (heat value), usually it will be to the basic standard fuel (i.e. reference fuel). But the Regulation requires certain accuracy with both fuels. This can be solved very often only if the whole tolerance band will be used leading to a signal with less accuracy for both fuels. In some cases it is very often extremely difficult to meet this requirement by this kind of "miss-calibration". Nevertheless the physical power difference will remain.

3. To increase the accuracy of the torque values used for calculating the emission results during in-service conformity testing OICA proposes to change the provisions in order to:

(a) Either demonstrate that both fuels comply because the system is able to detect the fuel used,

(b) Or alternatively to determine the torque deviation caused by the alternative fuel heat value compared to the standard fuel. This torque deviation will be documented in the information document as a power correction factor. Using this correction factor the ECU power submitted from the ECU during PEMS testing with an alternative fuel can be converted to a correct and true power signal for emission calculation.